

SUMMARY

INTRODUCTION

The Intertie Participants Group (IPG), also referred to as the Applicant, is proposing to construct an electrical transmission line (the Enstar Route) between the Kenai Peninsula and Anchorage along the Enstar pipeline through the Kenai National Wildlife Refuge (KNWR) in south-central Alaska. This 138 kilovolt (kV) transmission line, known as the Southern Intertie Project (Project), is proposed as a system improvement project to increase the overall Railbelt electrical system reliability and transfer of energy capabilities between the Kenai Peninsula and Anchorage. Members of the IPG include Golden Valley Electric Association (GVEA), Matanuska Electric Association, Chugach Electric Association (CEA), Anchorage Municipal Light and Power (AML&P), Homer Electric Association (HEA), and the City of Seward.

This Southern Intertie Project Draft Environmental Impact Statement (DEIS) has been prepared in compliance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321-4346) and the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500 through 1508). The preparation of this DEIS is required because GVEA, an IPG member, plans to apply to Rural Utilities Service (RUS) for financial assistance for its share of the proposed project. This DEIS is also required because the Applicant has filed for a right-of-way across federal lands on the KNWR, a Conservation System Unit designated under the Alaska National Interest Land Conservation Act (ANILCA). Rights-of-way across Conservation System Units for transportation and utility systems are governed by regulations (43 CFR Part 36) implementing Title XI of ANILCA. The RUS, an agency of the U.S. Department of Agriculture, is the lead federal agency for NEPA compliance. The U.S. Fish and Wildlife Service (USFWS) of the Department of the Interior and the U.S. Army Corps of Engineers (USACE) are cooperating agencies in the NEPA process.

The Project is located within the Railbelt electrical system, a power grid that electrically connects central and south-central Alaska from Homer to Fairbanks. The system allows the six participating utility companies, also referred to as the Railbelt Utilities, to sell and buy power to and from each other, taking advantage of lower costs in other areas, and to provide back-up power to each other. The IPG was formed by the Railbelt Utilities to improve electrical reliability and coordination within the Railbelt by working together to improve the interconnected system through intertie improvements and cooperative energy projects. The Southern Intertie Project is one of these cooperative projects.

PURPOSE AND NEED

Project Need

This Project is needed because the existing Railbelt electrical system is deficient south of Anchorage. The 115kV Quartz Creek transmission line currently provides the sole path for

coordinating the operation of generation on the Kenai Peninsula with Anchorage area generation. The line also is used to provide back-up power in the case of outages in the Anchorage area or on the Kenai Peninsula. The Quartz Creek transmission line is limited in electrical transfer capability (70 megawatts [MW]), and its ability to provide reliable back-up power during system outages is subject to outages from ice, wind, and snow loading. The line is also routed across known and historically active avalanche areas. To allow full use of the Kenai Peninsula generation, the intertie secure transfer capacity needs to be increased to 125 MW. The Project would provide the increased transmission capacity to make these higher transfers possible in a secure manner by creating a transmission loop to increase reliability and provide a second path for power to flow during an outage of the Quartz Creek transmission line.

In addition, the limitation of 70 MW of power transfer capability along the existing Quartz Creek transmission line reduces the ability to fully utilize the 120 MW generating capacity of the Bradley Lake Hydroelectric Project, owned by the State of Alaska. At the time the Power Sales Agreement for the Bradley Lake energy was signed, it was recognized that additional transmission line (interties) would be needed between the Kenai Peninsula and Fairbanks for system reinforcement and the capability to transfer the Bradley Lake hydro power throughout the Railbelt system. The 1992 Kenai Peninsula Borough Comprehensive Plan acknowledged that to fully utilize the Bradley Lake Project, additional transmission line upgrades are needed to carry power to Anchorage and Fairbanks.

Project Objectives

The systems and economic studies that were conducted on the Railbelt system identified several objectives that, if met, would correct the deficiencies and make the system run more economically and effectively. Specifically, the proposed Project would provide a second path for power to flow between the Kenai Peninsula and Anchorage and is needed to accomplish the following objectives:

- increase the reliability of the interconnected Railbelt electrical system from the Kenai Peninsula to Fairbanks, and reduce the requirement for load shedding during system disturbances
- increase the power transfer capacity between the Kenai Peninsula and Anchorage area
- provide the capability to utilize the most economic generation mix available to reduce costs to consumers and allow generation capacity in one area to support the load in the other area
- reduce area requirements for spinning reserve generation, thereby reducing operating costs and increasing the life-span of generation plants
- improve Railbelt electrical system stability

- reduce transmission line losses for power transfers and reduce maintenance costs
- provide adequate access to power entitlements from the Bradley Lake Hydroelectric Project for the utilities north of the Kenai Peninsula, and allow Bradley Lake generation to be more fully utilized

The Alaska Systems Coordinating Council (ASCC), an association of Alaska's electric power utilities, reviews the Alaska interconnected system on a continuing basis to promote reliable system operation through coordinated planning and operation of the system. In 1991, based on discussions with the North American Electric Reliability Council (NERC), ASCC adopted 12 coordinated interconnection planning and operating criteria (Table S-1), adapted specifically to Alaska from NERC's industry-standard planning guides for bulk electric system planning. The Southern Intertie Project objectives would help the IPG meet 8 of the 12 ASCC criteria (numbers 1-6, 8 and 9 in Table S-1).

The benefits from construction and operation of the Project have been studied and evaluated in detail. Because the interconnected system operates in an integrated manner, benefits from the Project have been evaluated by reviewing the effect of the Project on the overall system. The benefits of the project would include:

- capacity sharing
- economic energy transfer
- reliability
- spinning reserve sharing
- reduced line maintenance costs
- avoiding minimum combustion turbine generation on the Kenai Peninsula
- avoiding loading the line during bad weather or construction

The value of the benefits from the Project can also be viewed as cost savings. If the Project is not constructed, the unrealized benefits would continue to be part of the overall cost of producing electricity, and those costs would be reflected in the rates for electricity paid by consumers.

TABLE S-1 ASCC PLANNING AND OPERATING CRITERIA	
1.	Balance Among System Elements - A balanced relationship shall be maintained among bulk electric system elements to avoid excessive dependence on any one element.
2.	Contingencies - Additions to the interconnected system shall be planned and designed to allow the interconnected system to withstand any credible contingency situation without excessive impact on the system voltages, frequency, load, power flows, equipment thermal loading, or stability.
3.	Emergency Support - Reserves shall be provided such that emergency support from adjacent systems is restricted to acceptable limits as determined by studies of the interconnected system.
4.	Support From Adjacent Systems - Adequate transmission ties between adjacent systems shall be provided to accommodate planned and emergency power transfers.
5.	Reactive Power Resources - Each control area shall provide sufficient capacitive and inductive resources at proper levels to maintain system steady state and dynamic voltages within established limits, including support for reasonable levels of planned and emergency power transfers.
6.	Real and Reactive Power Margins - Margins in both real and reactive power resources are provided for acceptable dynamic response to system disturbances.
7.	Recording System Parameters - Essential system parameters shall be recorded.
8.	Reliability During Maintenance - System design shall allow for equipment maintenance without unduly degrading.
9.	Switching Flexibility - Switching arrangements shall be provided to limit adverse effects and permit reconfiguration of the bulk power transmission system to facilitate system restoration reliability.
10.	Protective Relaying - Provide sufficient relaying equipment such that the severity and extent of the system disturbances is minimized and that malfunctions in the protective relay system do not jeopardize system reliability.
11.	Black Start-up - Black start-up capability is to be provided for individual systems.
12.	Fuel Supply - Plans for generation additions shall consider fuel supply diversity.

ALTERNATIVES STUDIED IN DETAIL INCLUDING THE APPLICANT'S PROPOSAL

The following discussion provides a brief summary of the no-action alternative, the Applicant's proposed Enstar Route and alternative Tesoro Route locations, associated project facilities, and construction seasons.

No-Action Alternative

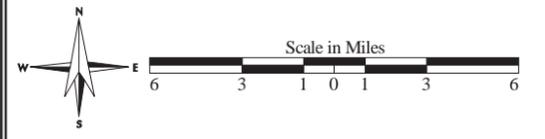
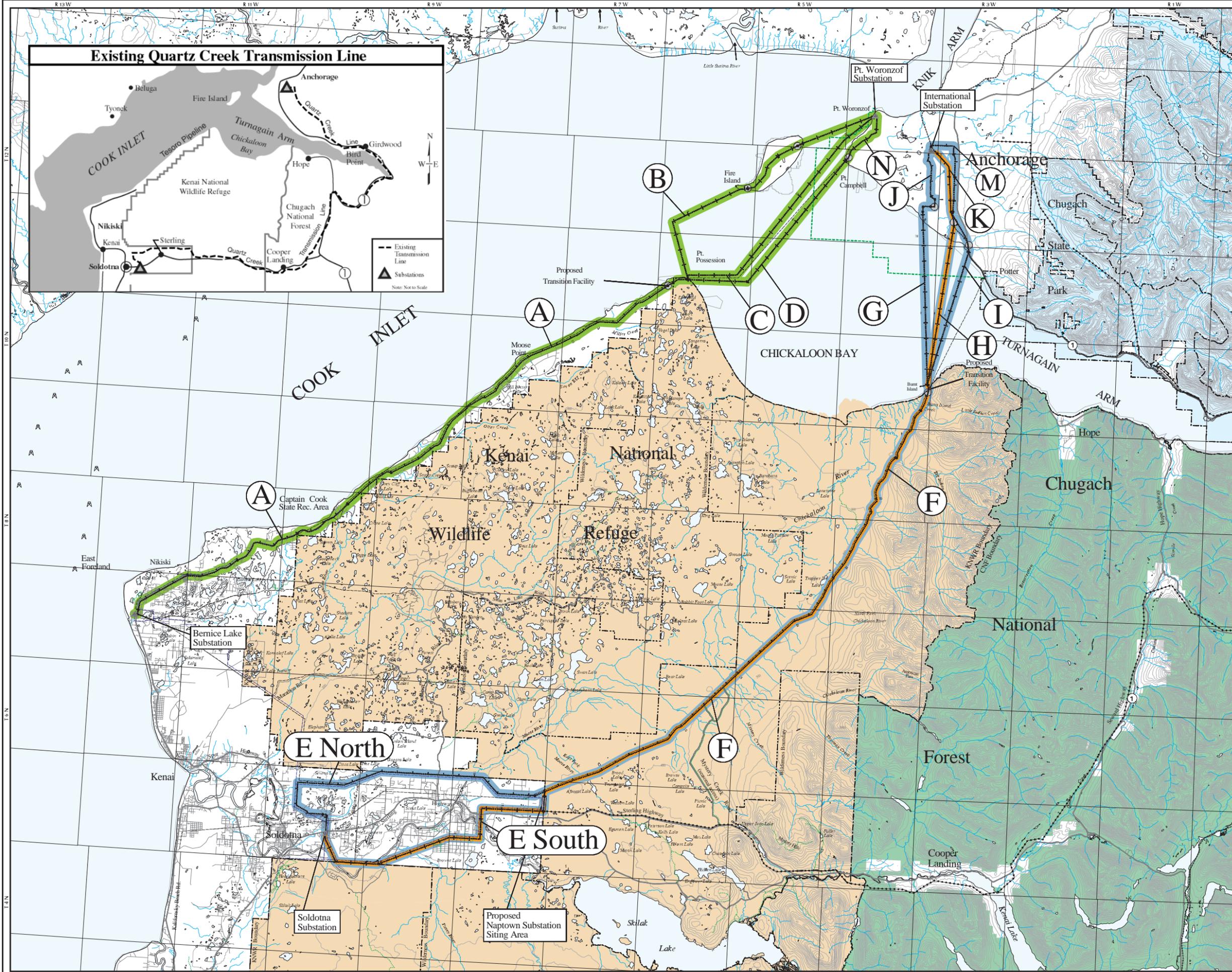
Implementation of the no-action alternative would mean that the Project would not be constructed and the Quartz Creek transmission line between the Soldotna Substation on the Kenai Peninsula and the University Substation in Anchorage would continue to be utilized as the only electrical connection between Anchorage and the Peninsula region (Figure S-1, see inset). There would be no improvements to the system to address the current electrical system deficiencies associated with this line. Overall, the Railbelt electrical system reliability and transfer of energy capabilities between the Kenai Peninsula and Anchorage would not be

**ALTERNATIVES STUDIED
IN DETAIL
SOUTHERN INTERTIE PROJECT
FIGURE S-1**

Legend

- Applicant's Proposed Route
- Enstar Route Options
- Tesoro Route Options
- Chugach State Park
- Kenai National Wildlife Refuge
- Chugach National Forest
- Private, Borough, or State Selected Lands

Note: No-action alternative is shown in inset in upper left-hand corner of map.



Base Map Sources:
 Municipality of Anchorage (1994).
 Chugach National Forest (1995).
 Kenai Peninsula Borough (1994).
 USGS 1:63,360 and 1:25,000 Quads.
 Contour Interval: 200 Feet
 Contour Labeling in Feet

increased. Additionally, the cost savings that would accrue from construction of the Project would continue to be part of the overall cost of producing electricity, and those continuing costs would be reflected in the rates for electricity paid by consumers.

Applicant's Proposal – Enstar Route

The Applicant's proposal is to construct a 138kV transmission line and associated facilities between the Soldotna Substation on the Kenai Peninsula and International Substation in Anchorage. The Applicant's proposed route is the Enstar Route including Route Options E South, F, H, and K (see Figure S-1). This route begins with an overhead transmission line at the existing substation in Soldotna and replaces an existing 69kV line, running south and then east to the Enstar pipeline (Option E South). At this point the route parallels the Enstar pipeline north through the KNWR for approximately 38.3 miles along Route Option F to Burnt Island on the east side of Chickaloon Bay. An ANILCA application for the crossing of KNWR is on file with USFWS and USACE. Submarine cables would be used to cross the Turnagain Arm to Oceanview Park on the southern end of Anchorage and from the landing point, underground cable would parallel the Alaska Railroad north to 120th Avenue (Route Option H). From there, an overhead line would continue to parallel the Alaska Railroad to the existing International Substation (Route Option K). The overall length of the proposed Enstar Route is 73.4 miles.

A local Enstar Route alternative is shown on Figure S-1, in the Soldotna area (E North), that travels north and east from the Soldotna Substation. In addition, there are two alternative routing options across Turnagain Arm and in the Anchorage area (Route Options I, M, and G, J), as shown in Figure S-1.

Tesoro Alternative

The Tesoro Route alternative is located between the Bernice Lake Substation on the Kenai Peninsula and the Pt. Woronzof Substation in Anchorage. The Tesoro Route includes Route Option A – Bernice Lake to Pt. Possession, in combination with any of three options that cross the Turnagain Arm and terminate at the Pt. Woronzof Substation (see Figure S-1). This route begins as an overhead transmission line at the existing Bernice Lake Substation near Nikiski (Route Option A), and parallels the North Kenai Road to the south end of Captain Cook State Recreation Area (SRA). Underground cable would parallel the North Kenai Road through the Captain Cook SRA and would also occur where the route is adjacent to two local airstrips along the North Kenai Spur Road. The line would transition back to overhead beyond the north end of the Captain Cook SRA and would parallel the Tesoro pipeline to Pt. Possession. In this area, the Tesoro Route would cross two areas of Native conveyed lands. One near Grey Cliff Lake (less than 1 mile) and one at Pt. Possession (approximately 1 mile). Section 22(g) of the Alaska Native Claims Settlement Act (ANCSA) permitting and regulatory requirements would apply to these lands.

At Pt. Possession, three options (B, C and D) are available to cross the Turnagain Arm and terminate at the Pt. Woronzof Substation. Route Option D would cross the Turnagain Arm from Pt. Possession to Pt. Campbell using submarine cables. From the Pt. Campbell landing, underground cable would continue to parallel the Tesoro pipeline through Kincaid Park and terminate at the Pt. Woronzof Substation (Route Option N). The total length of the Tesoro Alternative Route using this option is 62.0 miles (see Figure S-1).

Route Option B crosses Turnagain Arm via Fire Island to the Pt. Woronzof Substation. The total length of the Tesoro Alternative Route using this option is 63.2 miles. Using Route Option C, which crosses the Turnagain Arm directly from Pt. Possession to a landing at the Pt. Woronzof Substation, the total length of the Tesoro alternative is 61.3 miles (see Figure S-1).

Project Facilities

The following five separate types of facilities and associated construction techniques are required for the Project:

- **Overhead Transmission Lines** - Overhead transmission lines with the conductors supported on steel or wood structures are proposed for portions of the Anchorage area and the Kenai Lowlands.
- **Underground Lines** - Underground lines are high-voltage transmission line cables buried below ground surface in a duct bank. Underground lines are proposed for selected locations in the Anchorage area and in the Kenai Lowlands.
- **Submarine Cable** - Submarine cable is specially constructed to operate in a marine environment and is more rugged than the cables used on land. Submarine cable is proposed for crossing the Turnagain Arm.
- **Transition Stations** - A transition station is equipped to change a transmission line from one type to another. Transitions from overhead lines to underground or submarine cable, or from underground cable to submarine cable, would be required for the Project. Terminal facilities for the submarine cables are included in the transition stations. Transition stations would be required near the landfalls for the submarine cable, and at selected locations in the Kenai Lowlands and Anchorage area.
- **Substations and Reactive Compensation** - Substations are located at the ends of transmission lines and at generation plants, and are the points at which the electrical system is joined together to form a network. Reactive compensation involves installation of specialized equipment in a substation to provide voltage support for the system or to increase power flow across a transmission line segment. Modifications to existing substations would be required either at International or Pt. Woronzof substations in the Anchorage area, and at either Bernice Lake or Soldotna substations on the Kenai

Peninsula. For the Enstar Route, a new substation would be required near Naptowne. Modifications would also be required at the Dave's Creek Substation for either option.

Construction Season

It is intended that the majority of the construction activities would take place during the summer season (April to October). The exception to this is for the overhead transmission lines along the Tesoro Route north of the Captain Cook SRA, Enstar Route within the KNWR, and selected portions of the Soldotna E South Route option along the Kenai River Lowlands. In these areas, winter construction is proposed to minimize environmental impacts.

ALTERNATIVES ELIMINATED FROM DETAILED STUDY

Other alternatives considered were established through a comprehensive review of previous Project documentation and emerging energy systems. Through a comprehensive screening process, each alternative was assessed for its ability to meet the stated purpose and need, and as a result, some alternatives were eliminated from further consideration. Alternatives that initially were considered but then eliminated are listed below and then specifically described:

- Alternatives to a new transmission line eliminated
 - battery energy storage systems
 - demand-side management and energy conservation
 - conventional new generation
 - wind generation
 - fuel cells
 - increasing spinning reserves
- Alternative transmission systems eliminated
 - upgrade of the existing Quartz Creek transmission line
 - alternate voltage levels
 - underground transmission lines
- Alternative transmission routes eliminated
 - Quartz Creek transmission route parallel
 - Sixmile Creek to Anchorage (Submarine) Route
 - Tesoro Route local options
 - Enstar Route local options

Alternatives to a New Transmission Line Eliminated

Battery Energy Storage Systems - A Battery Energy Storage System (BESS) consists of a very large bank of electric batteries and automatically controlled electronic equipment to convert the

electric energy stored in the batteries from direct current (DC) to alternating current (AC) that can be supplied to the electrical transmission system. The BESS would only partially meet the purpose and need for the Project because it will not allow economic operation of generating units due to its limited storage capacity.

Conventional Demand-Side Management and Energy Conservation - Demand-side management (DSM) consists of electric utilities planning, implementing, and monitoring activities designed to encourage consumers to modify their levels and patterns of electricity consumption. These DSM programs focus on managing a very small part of the load on the system, whereas the Project need is for improvements to the entire interconnected system. Therefore, DSM programs do not address the purpose and need for the Project and were not considered further as an alternative to the Applicant's proposal.

Conventional New Generation - Adding generation capacity on the Kenai Peninsula and/or in Anchorage was considered as an alternative to constructing a second line from the Kenai Peninsula to Anchorage. Adding the generation capacity would increase the generation resources available to serve load on the system; however, the overall system currently has an excess of generating capacity over electrical load. What is needed is an enhanced ability to use the existing generation resources in the most economical matter. This alternative, therefore, does not meet the Project purpose and need and was not carried forward for further consideration.

Wind Generation - Harnessing the wind to provide electric generation resources has been successful in California and in other parts of the world. As noted earlier, additional generation is not needed and this alternative would not meet the Project purpose and need.

Fuel Cells - Fuel cells are power-generating systems that produce electricity by combining hydrogen and oxygen in an electrochemical reaction. Additional generation is not needed and is not considered a viable alternative to the Project.

Increasing Spinning Reserves - Spinning reserve is a portion of the operating reserves maintained by utilities. Spinning reserve is unloaded generation, which is synchronized and ready to serve additional demand (NERC 1996). One of the reasons the Project is being proposed as a system improvement is to reduce spinning reserve requirements. Consequently, increasing the amount of spinning reserves on the system was eliminated as an alternative.

Alternative Transmission Systems Eliminated

Upgrade of the Existing Quartz Creek Transmission Line - One alternative that initially was considered was the upgrade of the existing Quartz Creek transmission line instead of constructing a second transmission line, to increase the power transfer capacity between the Kenai Peninsula and Anchorage. The high cost of reconstructing all of the intermediate substations along the line, minimal change in performance, and reliability and stability issues resulted in elimination of this option.

Alternate Voltage Levels - Voltages of both 138kV and 230kV were studied for the second transmission line interconnection between the Kenai Peninsula and Anchorage. The 230kV alternative would require larger and more expensive equipment than the 138kV alternative without corresponding benefits and was eliminated; 138kV is proposed for the Project.

Underground Transmission Lines - Underground transmission has been proposed only where required by regulations and/or to avoid hazards that would be associated with an overhead line. The cost of underground transmission typically is four to five times the cost of an overhead line, and the operational problems and outage durations are greater. When an outage to an underground line occurs, determining the cause and location of the damage, the replacement parts needed to repair the line, and actually repairing the line takes more time than for an overhead line. Repairs to an underground line are more expensive as well. While industry data indicate that the outage rate for underground transmission lines is lower than for overhead lines, this is offset by the high installation and repair costs for the underground facility as compared to overhead lines. Therefore, overhead lines are preferred to underground lines.

Alternative Transmission Routes Eliminated

Quartz Creek Transmission Route Parallel - One alternative for the Project would be to parallel the existing 140-mile-long Quartz Creek transmission line corridor between Soldotna and Anchorage. The general types of issues associated with this alternative are summarized below:

- conflicts with the Chugach National Forest and Chugach State Park; views from Seward Highway (National Scenic Byway), Cooper Landing, and several other environmentally sensitive areas
- avalanche hazards and problems due to ice, wind, and snow along the route have caused numerous outages to the existing Quartz Creek transmission line
- opportunity to utilize an existing transmission line corridor
- relative differences between the risks to the Quartz Creek transmission line due to the presence of avalanches, in comparison to the potential failures to the Tesoro Route due to adverse submarine conditions near Pt. Possession

As a result of these concerns and the ensuing studies, the Quartz Creek Route was eliminated from further consideration for the following reason:

- It would not meet the purpose and need for the Project because it would be exposed to the same avalanche, ice, snow, and wind conditions as the existing line, and system reliability and energy transfer capability would remain limited.

Sixmile Creek to Anchorage (Submarine) Route - This alternative was presented as an option to utilize a portion of the existing Quartz Creek transmission line corridor, reduce avalanche exposure, and avoid Chugach State Park by locating the line in the Turnagain Arm from Sixmile Creek to Anchorage. This alternative would still be approximately 115 miles long, which would increase costs of the Project substantially; therefore, it was eliminated from further consideration.

Tesoro Route Local Options - The following local options were considered and have been eliminated, as listed below:

- bury transmission line from Bernice Lake Substation to Moose Point
- several alternatives were identified to avoid the Captain Cook SRA and Pt. Possession; they would result in significant impacts that could be mitigated by utilizing options that follow Kenai Road and the Tesoro pipeline
- Moose Point to Fire Island via submarine cable
- use of a causeway that would connect Pt. Possession to Anchorage

Enstar Route Local Options - The following local options were considered and have been eliminated, as listed below:

- Enstar underground option
 - Bury the line through the KNWR
- Alternatives from Pt. Possession to Anchorage via Enstar pipeline
 - Cross KNWR and/or Chickaloon Bay to Enstar pipeline at Burnt Island
- South Anchorage route options eliminated
 - New and Old Seward highways from Potter Marsh to Rabbit Creek Interchange
 - Alaska Railroad/Ocean View Bluff

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The character of the existing environment in the Project area and potential environmental consequences, or impacts, that could result from the proposed Project are summarized below and followed by an overview of the environmentally preferred alternative route:

Climate - The climate of south-central Alaska is transitional between maritime and continental. Heavy precipitation, cool summers, and mild winters characterize the maritime regions of the coast. The Cook Inlet basin experiences short periods of extreme cold in winter and high winds throughout the year. No impacts to climate are expected as a result of this project.

Air Quality - The majority of the study area is classified as an air quality attainment area with the exception of urban Anchorage (non-attainment for carbon monoxide) and the Eagle River area of Anchorage (non-attainment for particulate matter nominally 10 microns or less).

Air quality impacts associated with the proposed project would be minimal and of a short-term nature, and would result from construction-related causes such as an increase in air emissions from construction equipment and motor vehicles.

Earth Resources - The study area includes portions of two physiographic provinces within the Southern Mountainous Belt of Alaska: Cook Inlet-Susitna Lowlands and Kenai-Chugach Mountains. Due to the active seismicity in the region, soils and surficial deposits in the study area are subject to several types of ground failure associated with earthquakes in addition to the more expected hazards of slope instability, erosion, settlement, permafrost, and frost heave. The study area contains a variety of nonmetallic mineral resources, including sand and gravel, clay, and coal.

Impacts to soils will be minimal after standard mitigation measures are applied. These measures include preferential use of existing access roads, winter work when the ground is frozen, and use of tracked and low ground pressure vehicles or other special equipment.

Water Resources - The Kenai River is the only glacier-fed river in the study area and has distinctive runoff characteristics. Nonglacial streams in the Kenai Lowlands and Anchorage Bowl originate from lowland lakes and tributaries of the western portion of the Kenai Lowlands and Chugach Mountains. These drainage channels are typically low-gradient, meandering systems that flow high in spring from snowmelt and high in late summer and autumn from rain.

Impacts to streams will be minimal after standard mitigation measures are applied. These measures include spanning streams, suspending transmission lines beneath existing bridges, boring under streams, and scheduling installations during winter months.

Submarine Environment - The physiography of the study area can be described as a large tidal estuary. The seafloor in this area comprises mudflats with tidal channels and deeper channels or depressions. At low tide, approximately 70 percent of the seafloor within Turnagain Arm is exposed as elongate bars dissected by braided tidal channels. Tides within Cook Inlet and Turnagain Arm are mixed, with two unequal high and low tides per tidal day. Estuarine deposits, large quantities of sediment, boulder patches, and sea ice are all present in this marine environment.

Impacts to submarine environment would be minimal; however, with adherence to selective mitigation, the environmental impact would be further reduced to a non-significant level.

Biological Resources - The project area supports diverse biological resources. The six major vegetation types present along alternative transmission line routes are habitats for many wildlife species. Thirty-five species of mammals, 127 species of birds, and 28 species of fish are expected to occur in the study area. Many of these same species also occur in the Anchorage

area. Special status plant and wildlife species, species of concern to various agencies, are known or have the potential to occur along the alternative routes.

The primary concern regarding biological resources is the effects on special status plants and wildlife species, vegetation (loss of habitat), and wildlife. An area of special concern is the KNWR. Possible impacts could include collision hazards (birds), loss of habitat, and increased human access. Any significant impact on the KNWR will be considered nationally significant. However, these impacts can be reduced through mitigation.

Land Use and Recreation - The study area includes lands administered by federal, state, borough, and municipal agencies; and lands privately owned in south-central Alaska. The alternative routes traverse portions of the Municipality of Anchorage and the Kenai Peninsula Borough (KPB), along with portions of the KNWR. Urban land uses in Anchorage include parklands, residential, commercial, industrial, and areas managed for recreation and wildlife purposes.

The types of direct impacts on land uses include areas where the project would create a direct conflict with residential, commercial, industrial, or transportation uses and those areas where severance of currently vacant parcels could affect future development. However, these impacts will not be significant, as mitigation measures have been identified to reduce impacts. These measures include utilizing existing access roads, closing access roads that are bladed for construction but not needed for maintenance, avoiding sensitive features by spanning, shifting an alignment, or moving an alignment to the opposite side of existing lines (when paralleled).

Socioeconomics and Tourism - The Project study area includes portions of the Municipality of Anchorage and the KPB. Within the KPB, there are two cities and one unincorporated community. The population of the KPB has increased 46 percent since 1980, reaching 46,790 in 1996. The KPB has a diverse economy with the contribution of oil and gas, tourism, fishing and fish processing, transportation, timber, retail, and government sectors. The population of Anchorage has grown by 45 percent since 1980, reaching 254,269 in 1996. Anchorage is the state's largest city and is the center of commerce for the state. The city has a diverse economy with oil and gas, finance and real estate, transportation, retail, services, communications, and government sectors represented.

Potential impacts include temporary increases in population, employment, and income during construction, and longer-term changes in or impacts on existing economic activities or land uses.

Subsistence - There are no designated rural communities in the Anchorage Bowl portion of the study area. The subsistence analysis conducted for this DEIS focused on three communities near the study area whose residents do some subsistence harvesting within the study area: Ninilchik, Cooper Landing, and Hope. Data compiled in 1982 indicated that 92 percent of all Ninilchik households participated in subsistence harvests. Sample data compiled for 1990 to 1991 indicate that all households in Cooper Landing and Hope used subsistence resources.

No negative impact on populations of relevant species that would impair subsistence practices is anticipated. Impacts on subsistence are not projected to be significant, and do not vary significantly among the alternatives considered. Therefore, subsistence resources are not a critical factor in selecting among the Project alternatives.

Visual – The study area contains a variety of landscapes and viewing conditions, from the mostly urban environment of Anchorage to the natural and wilderness areas of the Kenai Peninsula. The surrounding regional landscape features, including the Cook Inlet and Turnagain Arm, Chugach Mountains, Alaska Range, and northern chain of the Aleutian Mountains, contribute to the scenic quality of the Project area. Developments on the Kenai Peninsula, such as Soldotna and Nikiski, occur in rural settings. The KNWR includes landscapes, which are heavily vegetated, consisting of coastal marshes, forested wetlands, shrub bogs, muskegs, upland spruce hardwood forests, and bottomland spruce poplar forests.

Significant visual impacts in the City of Anchorage include impacts resulting from views of the proposed Project from travelers and residences. Mitigation to impacts in Anchorage includes paralleling or rebuilding existing structures and utilizing existing rights-of-way. Significant impacts on the Kenai Peninsula occur in areas including Soldotna, Nikiski, and through the KNWR along the Enstar pipeline. These impacts result from the disruption of local viewsheds, the visibility of structures, right-of-way clearing, and associated ground disturbance. Mitigation to these impacts includes winter construction, variable right-of-way clearing, lowering tower heights, or altering the type of tower structure utilized in selected areas.

Cultural Resources - More than 600 archeological and historical sites listed in the Alaska Heritage Resource Survey are present within the broad region in which the proposed Project is located. One of these, the Holy Assumption Church in Kenai, is designated as a National Historic Landmark. Forty-three of the more than 600 sites have either been determined eligible for or listed in the National Register of Historic Places. The nomination of 14 additional properties to the Register is pending.

The alternatives avoid known archaeological and historic sites, and no high impacts are projected along any of the alternatives. The degree of variation in cultural resource impacts among the alternatives is not a major factor in choosing among the options. Detailed cultural resource surveys will be conducted along the route chosen for construction. Mitigation measures will be developed in consultation with the State Historical Preservation Office to reduce impacts to sites.

Electric and Magnetic Fields and Noise - The two origins of transmission line electrical effects are electric and magnetic fields. Electric fields are due to the voltage on the transmission line and the magnetic fields are due to the current through the conductor. Electrical effects near transmission lines also include possible audible noise and radio/television interference.

The line voltage and the distance of prospective line routes from residences reduce the likelihood of objectionable audible noise, radio interference, or television interference from the line. Impacts are expected to be minimal. Noises associated with operation and maintenance of the Project will be minimal, confined to localized, short-duration activity by maintenance crews. The

electric and magnetic field (EMF) levels associated with the Project would be less than all existing EMF standards or guidelines. Therefore, EMF of the Project are not anticipated to cause adverse health or biological effects.

Cumulative Impacts - The greatest potential for cumulative impacts appears to be on biological and visual resources, especially in the Kenai Peninsula region. Cumulative impact issues that differentiate the Tesoro and Enstar alternatives are influenced by the uses associated with existing and foreseeable future effects to the northern Kenai Peninsula from development associated with the KPB versus the KNWR.

The KPB has planned a transportation corridor, a separate road, and several large residential parcels for rural development in proximity to the Tesoro pipeline along the western edge of the Kenai Peninsula, north of Nikiski. This development is planned along a strip of land that was withdrawn from the KNWR in order to provide transportation access between the Kenai Peninsula and Anchorage. Land use conflicts will be minimized or avoided by utilizing the rights-of-way of the North Kenai Spur Road, the planned transportation corridor, and the Tesoro pipeline right-of-way. Visual impacts on existing and planned residents could be significant, although there is the potential for vegetation screening to reduce the effects. The quality of the wildlife habitat is in transition based on current and planned development on borough lands.

Cumulative impact issues along the Enstar Route center on potential land use, visual, and biological impacts. The existing and future foreseeable development along the western portion of the KNWR is occurring within the highest quality habitat for moose, wolves, lynx, black bears, and brown bears. As this habitat gradually lowers in habitat quality, there will be additional importance to improve the quality of the area along the Enstar pipeline corridor with the prescribed burn program. Prescribed burns allow areas of mature spruce forests to be replaced by a mosaic of brush and early successional species that improves habitat for numerous species including moose. The Enstar Route would conflict with the prescribed burn program as well as increasing access in brown bear habitat. The cumulative effects on wildlife, vegetation, recreation, and visual resources within the KNWR along Route Option F are considered to be long term and significant. Any conflicts between the ability to diversify the habitat and presence of the proposed transmission line would be considered significant cumulative impacts.

Alternative Route Comparison - Table S-2 provides a comparative summary for the Tesoro and Enstar routes. This table provides information on key issues, project description and costs, and environmental assessment results including the analysis of impact significance, short-term and long-term impacts, irreversible and irretrievable impacts, and cumulative impacts.

There are a range of alternatives associated with both the Tesoro and Enstar routes as previously described and as illustrated on Figure S-4. For purposes of this comparison two alternative routes have been selected: the Applicant's Proposal, which is the Enstar Route including Options E South, F, H, and K; and the Tesoro Route, including Options A, D, and N. The Tesoro Route alternative chosen for comparison describes potential impacts on the Kenai Peninsula and specifically in Anchorage. The environmentally preferred alternative, Options A and C, would avoid impacts to the Anchorage area.

**TABLE S-2
SUMMARY COMPARISON OF ALTERNATIVES**

Evaluation Factors	Key Issues	Tesoro Route (Route Options A, D, N)	Enstar Route Applicant's Proposal (Route Options E South, F, H, K)
Engineering Considerations			
Project Description	Marine hazards associated with the ability to embed submarine cables under the Turnagain Arm in order to maximize the life of the cable. Suitable locations for transmission facilities.	<ul style="list-style-type: none"> ▪ Total length is 62.0 miles ▪ Parallels existing roads for 16.7 miles (including 0.5 mile parallel to existing transmission line and 4.9 miles of underground) ▪ Parallels the Tesoro pipeline for 27.4 miles ▪ Submarine crossing of the Turnagain Arm for 13.9 miles (5.8 miles embedded) ▪ Underground for 4.0 miles 	<ul style="list-style-type: none"> ▪ Total length is 73.4 miles ▪ Replaces or parallels existing transmission lines for 19 miles ▪ Parallels Enstar pipeline for 38.5 miles ▪ Submarine crossing of the Turnagain Arm for 10.5 miles (totally embedded) ▪ Parallels the Alaska Railroad for 5.4 miles (including 0.5 mile of underground)
Project Cost	Potential to embed submarine cables and the increased costs associated with assumed replacements affecting life cycle costs.	<ul style="list-style-type: none"> ▪ Cable replacement for non-embedded cables includes replacing two single phased cables or one three phase cable twice during project life ▪ Life cycle costs total \$114.5 million (includes construction, operation, and maintenance and cable replacement costs) 	<ul style="list-style-type: none"> ▪ Cable replacement for non-embedded cables includes replacing one single phased cable or one three phase cable once during project life ▪ Life cycle costs total \$ 99.6 million (includes construction, operation, and maintenance and cable replacement costs)
Environmental Considerations			
Air Quality	Degradation of air based on vehicle emissions and dust.	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes ▪ Long term – No ▪ Irreversible – No ▪ Irretrievable – Yes, construction phase ▪ Cumulative Impacts - No 	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes ▪ Long term – No ▪ Irreversible – No ▪ Irretrievable – Yes, construction phase ▪ Cumulative Impacts – No

**TABLE S-2
SUMMARY COMPARISON OF ALTERNATIVES**

Evaluation Factors	Key Issues	Tesoro Route (Route Options A, D, N)	Enstar Route Applicant's Proposal (Route Options E South, F, H, K)
Geologic Resources	Soil loss, erosion and compaction based on clearing and development of access and tower sites.	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes, localized ▪ Long term – Minimal ▪ Irreversible – No ▪ Irretrievable – No ▪ Cumulative Impacts - No 	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes, localized ▪ Long term – Yes, potential for accelerated erosion ▪ Irreversible – Yes, construction phase ▪ Irretrievable – Yes, construction phase with potential lingering effects ▪ Cumulative Impacts - No
Drainage Basins and Watersheds	Loss of vegetation cover, soil erosion and resulting sedimentation in streams based on vegetative clearing, development of access and tower sites.	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes, mainly localized ▪ Long term – Minimal due to flat terrain ▪ Irreversible – No ▪ Irretrievable – No ▪ Cumulative Impacts - Yes 	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes, construction phase ▪ Long term – Slight increase in runoff and sedimentation due to presence of access and right-of-way clearing ▪ Irreversible – No ▪ Irretrievable – Yes, construction phase with potential lingering effects ▪ Cumulative Impacts – Yes
Marine Environment	Degradation of marine environment during laying, embedding, or boring for cables during construction, and potential maintenance and repair activities, and replacement of cable.	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Minor, during cable laying ▪ Long term – Numerous hazard areas lead to potential for cable replacement twice over the life of the project. ▪ Irreversible – No ▪ Irretrievable – No ▪ Cumulative Impacts - No 	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Minor, during cable laying ▪ Long term – Embedded cable results in the potential for cable replacement once over the life of the project ▪ Irreversible – No ▪ Irretrievable – No ▪ Cumulative Impacts – No

**TABLE S-2
SUMMARY COMPARISON OF ALTERNATIVES**

Evaluation Factors	Key Issues	Tesoro Route (Route Options A, D, N)	Enstar Route Applicant's Proposal (Route Options E South, F, H, K)
Biology			
Vegetation and Wetlands	Loss of vegetative cover and disturbance to wetlands based on vegetation clearing for right-of-way, access, and towers, and compaction.	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes, construction phase ▪ Long term – Approximately 453 acres of upland vegetation removed. ▪ Irreversible – Yes ▪ Irretrievable – Yes, project life ▪ Cumulative Impacts - Yes 	<ul style="list-style-type: none"> ▪ Impact significance: Significant impacts due to clearing upland vegetation and compaction of wetlands on KNWR. ▪ Short term – Yes, during construction phase ▪ Long term – Approximately 530 acres of upland vegetation removed ▪ Irreversible – Yes ▪ Irretrievable – Yes, project life ▪ Cumulative Impacts – Yes
Birds including Bald Eagles, Trumpeter Swans and General Waterfowl	Disturbance during construction, loss of habitat, increased access, and potential increase in mortality due to presence of the line.	<ul style="list-style-type: none"> ▪ Impact significance: Potential for locally significant impacts due to tree clearing near nest sites and collision hazards near large lakes and at stream crossings. ▪ Short term – Can be avoided through seasonal construction ▪ Long term – Yes, clearing within proximity to bald eagle nest sites (three within 0.25 mile) ▪ Irreversible – Yes ▪ Irretrievable – Yes, project life ▪ Cumulative Impacts - Yes, trumpeter swans and general waterfowl. Potential, bald eagles. 	<ul style="list-style-type: none"> ▪ Impact significance: Potential for local and nationally significant impacts on KNWR due to tree clearing near nest sites and collision hazards near Chickaloon Bay, large lakes and at stream crossings. ▪ Short term – Can be avoided through seasonal construction ▪ Long term – Yes, clearing within proximity to bald eagle nest sites (two within 0.25 mile) ▪ Irreversible – Yes ▪ Irretrievable – Yes, project life ▪ Cumulative Impacts – Yes, trumpeter swans and general waterfowl. Potential, bald eagles.

**TABLE S-2
SUMMARY COMPARISON OF ALTERNATIVES**

Evaluation Factors	Key Issues	Tesoro Route (Route Options A, D, N)	Enstar Route Applicant's Proposal (Route Options E South, F, H, K)
Large Mammals including Brown Bears, Black Bears, Moose and Caribou	Disturbance during construction, conflicts with management and habitat plans, loss of habitat and potential increase for mortality based on access improvements.	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Temporary displacement of moose and disturbance to denning black bears during construction phase. ▪ Long term – Yes, mortality due to increased access ▪ Irreversible – No ▪ Irretrievable – No ▪ Cumulative Impacts - No 	<ul style="list-style-type: none"> ▪ Impact significance: Nationally significant impacts to brown bears, black bears and moose on the KNWR ▪ Short term – Temporary displacement of moose and disturbance to denning black bears during construction phase. ▪ Long term – Yes, mortality due to increased access and potential disruption to moose/habitat management plan and fire management plans within KNWR. ▪ Irreversible – Yes, on KNWR. ▪ Irretrievable – Yes, on KNWR. ▪ Cumulative Impacts – Yes, significant
Predators including Wolves and Lynx	Disturbance during construction, loss of habitat and potential for increased mortality based on access improvements	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes, temporary displacement during construction phase ▪ Long term – Increased harvest minimal in low abundance wolf and lynx habitat. ▪ Irreversible – No for wolf, and unknown for lynx. ▪ Irretrievable – No for wolf, and unknown for lynx. ▪ Cumulative Impacts – Not expected 	<ul style="list-style-type: none"> ▪ Impact significance: Nationally significant impacts on KNWR. ▪ Short term – Yes, temporary displacement during construction phase ▪ Long term – Increased harvest minimal in low to moderate abundance habitat for wolf and lynx. ▪ Irreversible – No for wolf, and unknown for lynx ▪ Irretrievable – No for wolf, and unknown for lynx. ▪ Cumulative Impacts – Not expected

**TABLE S-2
SUMMARY COMPARISON OF ALTERNATIVES**

Evaluation Factors	Key Issues	Tesoro Route (Route Options A, D, N)	Enstar Route Applicant's Proposal (Route Options E South, F, H, K)
Fish	Loss of vegetative thermal cover, soil erosion and resulting sedimentation in streams based on vegetative clearing, development of access and tower sites.	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes during construction phase ▪ Long term – No ▪ Irreversible – No ▪ Irretrievable – No ▪ Cumulative Impacts - No 	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes, during construction phase ▪ Long term – Potentially yes due to presence of access and right-of-way clearing. ▪ Irreversible – No ▪ Irretrievable – Yes, during construction phase ▪ Cumulative Impacts - Unknown
Marine Mammals including the Beluga Whale	Disturbance during construction, loss of habitat and increased mortality	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Temporary disturbance during construction phase, avoids conflicts with calving areas through seasonal construction ▪ Long term – Temporary disturbance during any repairs resulting from cable failure (projected to happen once over the life of the project). ▪ Irreversible – No ▪ Irretrievable – Unknown, during construction phase ▪ Cumulative Impacts – Unknown 	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Temporary disturbance during construction phase, avoids calving areas. ▪ Long term – Temporary disturbance during any repairs resulting from cable failure (projected to happen twice over the life of the project). ▪ Irreversible – No ▪ Irretrievable – Unknown, during construction phase ▪ Cumulative Impacts - Unknown

**TABLE S-2
SUMMARY COMPARISON OF ALTERNATIVES**

Evaluation Factors	Key Issues	Tesoro Route (Route Options A, D, N)	Enstar Route Applicant's Proposal (Route Options E South, F, H, K)
Land Use and Recreation	Disturbance, displacement of use(s) and potential conflicts with management plans	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes, during construction phase ▪ Long term – No ▪ Irreversible – No ▪ Irretrievable – Yes, during construction ▪ Cumulative Impacts - No 	<ul style="list-style-type: none"> ▪ Impact significance: Nationally significant impacts to recreation and land use on the KNWR. ▪ Short term – Yes, during construction phase ▪ Long term – Yes, conflicts with KNWR management plans and qualification criteria for wilderness designation ▪ Irreversible – Yes ▪ Irretrievable – Yes, project life ▪ Cumulative Impacts – Yes, significant
Socioeconomics	Regional and local employment, stability in region's power supply	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes, benefits based on employment opportunities ▪ Long term – Yes, benefits from rate reductions ▪ Irreversible – Yes ▪ Irretrievable – Yes, benefits for project life ▪ Cumulative Impacts – Minor positive cumulative effects 	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes, benefits based on employment opportunities ▪ Long term – Yes, benefits from rate reductions ▪ Irreversible – Yes ▪ Irretrievable – Yes, benefits for project life ▪ Cumulative Impacts – Minor positive cumulative effects
Subsistence	Disturbance to wildlife, increased access for hunting and trapping	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes, potential disruption to hunting and trapping during construction phase ▪ Long term – Minimal based on increased access ▪ Irreversible – No ▪ Irretrievable – No ▪ Cumulative Impacts - No 	<ul style="list-style-type: none"> ▪ Impact significance: Not significant ▪ Short term – Yes, potential disruption to hunting and trapping during construction phase ▪ Long term – Minimal based on increased access ▪ Irreversible – No ▪ Irretrievable – No ▪ Cumulative Impacts - No

**TABLE S-2
SUMMARY COMPARISON OF ALTERNATIVES**

Evaluation Factors	Key Issues	Tesoro Route (Route Options A, D, N)	Enstar Route Applicant's Proposal (Route Options E South, F, H, K)
Visual	Degradation of natural scenic quality and visual intrusion to residential, recreational, and travelway views.	<ul style="list-style-type: none"> ▪ Impact significance: Significant impacts (approximately 21 miles total including consideration for landscape scenery and residential, recreational, and travelway views) ▪ Short term – Yes, presence of equipment during construction phase ▪ Long term – Yes, presence of towers, conductors and access roads ▪ Irreversible – Yes ▪ Irretrievable – Yes ▪ Cumulative Impacts – Yes, locally significant 	<ul style="list-style-type: none"> ▪ Impact significance: Significant impacts, including nationally significant on KNWR (approximately 32 miles total including consideration for landscape scenery and, residential, recreational and travelway views) ▪ Short term – Yes, presence of equipment during construction phase ▪ Long term – Yes, presence of towers, conductors and access roads ▪ Irreversible – Yes ▪ Irretrievable – Yes ▪ Cumulative Impacts – Yes, nationally significant
Cultural Resources	Disturbance or removal of sites or fossils	<ul style="list-style-type: none"> ▪ Impact significance: No determination prior to consultation with State Historic Preservation Office, low to moderate impact potential ▪ Short term – Unknown ▪ Long term – Unknown ▪ Irreversible – Unknown ▪ Irretrievable – Unknown ▪ Cumulative Impacts - Unknown 	<ul style="list-style-type: none"> ▪ Impact significance: No determination prior to consultation with State Historic Preservation office, low to moderate impact potential ▪ Short term – Unknown ▪ Long term – Unknown ▪ Irreversible – Unknown ▪ Irretrievable – Unknown ▪ Cumulative Impacts – Unknown

An explanation of construction and life cycle costs are provided in Section 1.4.1 of the DEIS. A detailed description of Project alternatives is provided in Table 2-6 of the DEIS, and a comprehensive environmental comparison of Project alternatives is provided on Table 2-11 of the DEIS including environmental preference. Following is a brief description of the environmentally preferred alternative.

Environmentally Preferred Alternative – The environmentally preferred alternative is the Tesoro Route, Option A from Bernice Lake Substation to Pt. Possession, combined with a submarine cable crossing of the Turnagain Arm from Pt. Possession directly to Pt. Woronzof (Route Option C) for a total of 61.3 miles. This route is environmentally preferred because it exhibits on balance, lower overall environmental impacts than the other alternatives, as shown on Table 2-11 in the DEIS.

Any of the other Tesoro Route alternatives would also exhibit overall lower environmental impacts than the Applicant's proposed alternative and other Enstar Route options, primarily because of the impacts of the Enstar route where it crosses the KNWR on the Kenai Peninsula. Route Option B is a submarine cable that includes a crossing of Fire Island that connects with Pt. Woronzof, which would minimize environmental impacts in the Anchorage area. Lower impacts in the Anchorage area for the Tesoro Route alternatives would also result from the underground route from Pt. Campbell to Pt. Woronzof (Route Option N), assuming appropriate mitigation.

SCOPING, CONSULTATION, AND COORDINATION

In accordance with the requirements of NEPA, RUS published a Notice of Intent in the *Federal Register* in October 1996. The notice announced the intent of RUS to prepare an EIS for the Project and the schedule for the three public scoping meetings, which were conducted in Anchorage on November 12, Cooper Landing on November 13, and Soldotna on November 14. In addition to the public scoping meetings, RUS conducted an interagency meeting on November 6, 1996 in Anchorage.

In addition, the Applicant and its consultants contacted agencies and organizations having jurisdiction and/or specific interest in the Project. A series of agency and interagency meetings as well as two public meetings (January and February 1996) were conducted. Two community working groups were developed, one on the Kenai Peninsula and the other in Anchorage. Each group met five times at key milestones during the process.

All issues and concerns raised during the scoping process were analyzed in the Environmental Analysis prepared for RUS by the Applicant's consultants and have been considered in the preparation of this DEIS. A total of 14 issues were identified. They are listed below and discussed in more detail in subsequent chapters of this document.

- Issue 1 – Purpose of and Need for the Project
- Issue 2 – Urban and Rural Land Use
- Issue 3 – Aviation Safety

- Issue 4 – Recreation and Tourism
- Issue 5 – Management Plans
- Issue 6 – Watershed Management and Soil Erosion
- Issue 7 – Visual Resources
- Issue 8 – Biology
- Issue 9 – Cultural Resources
- Issue 10 – Right-of-way Limitations
- Issue 11 – Human Health and Safety
- Issue 12 – Avalanche Hazards
- Issue 13 – Socioeconomics
- Issue 14 – Alternatives to the Proposed Project